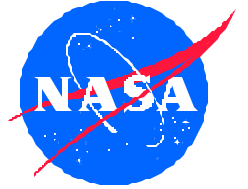
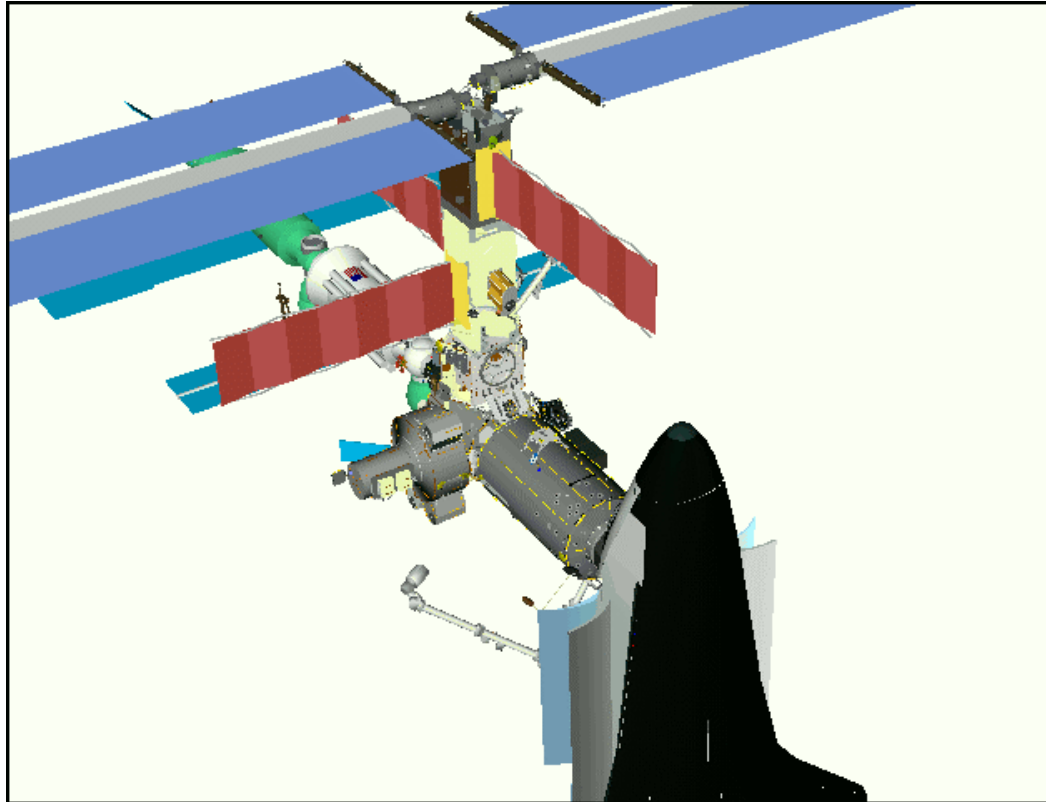




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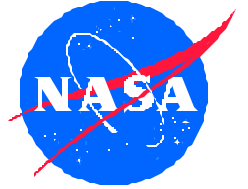


STS-105/7A.1 FRR



**EVA Project Office
Johnson Space Center**

**Maria Tullar
August 1, 2001**



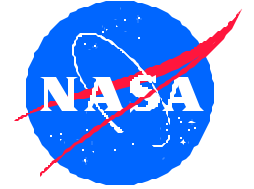
7A.1 EVA Mission Overview

- **EVA Capability**
 - Consumables to support two 10.2 psi scheduled EVA's out of Shuttle Airlock
 - One unscheduled EVA for mission success tasks not completed or ISS contingencies
 - Two contingency EVA's for orbiter, RMS, and ODS contingencies

- **EVA Training**
 - Crew to be fully trained on all EVA tasks
 - Planned EVA Training ratio is 9.5:1
 - All planned tasks can be accommodated within scheduled 6:30 timeline



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7A.1 EVA Mission Overview

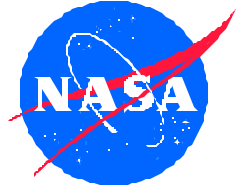
- **EVA 1 (Flight Day 7) - 6:30**
 - EAS transfer/installation
 - MISSE transfer/installation/deploy

- **EVA 2 (Flight Day 9) - 6:30**
 - On-orbit install handrail (OIH) installation
 - S0 LTA cable installation

- **8A Get-ahead Tasks**
 - APFR relocation
 - APFR/tool stanchion relocation
 - Preposition EVA tools



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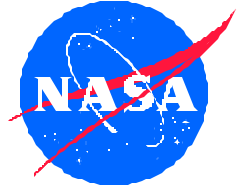
ISS-3 Station Based EVA

- **Three Scheduled EVA's**
 - Two DC-1 initialization EVA's
 - One utilization EVA Space Environment Exposure Device (SEED) and Microparticles Capturer (MPAC) installation (3 panels)
- **Unscheduled EVA Capability**
 - Two EVA margin from DC-1 in Orlan's
 - Three EVA margin from joint airlock in EMU's
- **Orlan Status**
 - Two Orlan's presently onboard
 - One Orlan scheduled for launch in DC-1 (September 2001)
- **Training**
 - Hydrolab and NBL training to support scheduled and unscheduled EVA's complete



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EMU and SAFER Logistics

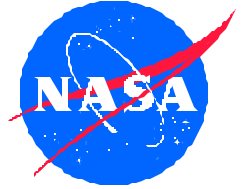


- **Two EMU's Manifested/Two EMU's On-orbit**
 - One extra large Planar and one large Planar launched on 7A.1
 - Two large Planar on-orbit post 7A
 - Two large Planar used for 7A.1 operations
 - STS-105/7A.1 to return from ISS with two large Planar from STS-104/7A
 - One extra large and one large left on ISS post 7A.1
- **One SAFER Manifested/Two SAFER's On-orbit**
 - One SAFER launched in MPLM
 - Two SAFER's left on-orbit by STS-100/6A



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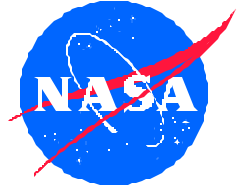
EMU and SAFER Logistics



- **EMU/SAFER FIAR's, Waivers, or Certification Issues**
 - EMU Failures
 - None
 - STS-104 IFA with Increased Capacity Battery (ICB) – Special Topic
 - EMU Waivers
 - Bends Treatment Adapter "In-Suit" Procedure Hazard Report and CIL Waiver (in place from STS-104)
 - ILC Voltage Regulator Hazard Report and CIL Waiver (approved at SSRP on July 25, 2001)



EMU and SAFER Logistics (cont'd)

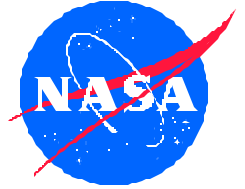


- **EMU and SAFER First Flight Hardware**
 - Extra large Planar hard upper torso (HUT)
 - EMU space suit assembly (SSA) stowage in MPLM
 - SAFER stowage bag
- **EMU and SAFER Hardware left on ISS after STS-105/7A.1**
 - One extra large and large (Dezhurov and Culbertson)
 - Three SAFER's and three SAFER batteries
 - MPLM hardware flown for 7A airlock staging (stowage IVA)
 - Modular mini-workstation (MMWS) equipment
 - METOX canisters (three)



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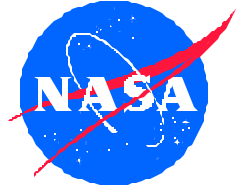
EVA Tools and Crew Aids Manifest Summary



- **EVA Tools and Crew Aids First Flight Items**
 - ISS EVA Ohm Meter (one), 9V batteries (four)
 - 1/4" QD Cap Removal Tool
 - S0 LTA bags
 - BMRRM vice clamp tool
 - Four-ball pip pins on EVA winch and mount assembly
- **Non-GFE EVA Hardware First Flight Items**
 - QD Extender Kit
 - MISSE clamps
 - S0 LTA cables
- **Standard contingency tools plus ISS cheater bar (ICC contingency) in Port TSA**
- **Sill-mounted PFR Configuration - None**
- **Standard complement of slidewires, safety tethers, crew hook locks, and winches in PLB**



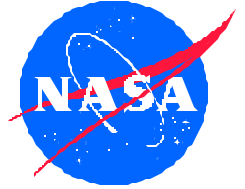
EVA Tools and Crew Aids Manifest Summary



- **EVA Tools and Crew Aids Left On-Orbit**
 - Airlock outfitting:
 - MMWS equipment, BRT (one), PGT, retractable equipment tether RET's (four)
 - ISS EVA Ohm Meter (one), 9V batteries (four)
 - 1/4" QD Cap Removal Tool (one)
 - QD extender kit
 - S0 LTA bags (two)
 - BMRRM vice clamp tool
- **EVA Tools and Crew Aids Swapped On-Orbit**
 - None
- **EVA Tools and Crew Aids Returned**
 - None
- **EVA Tools and Crew Aids FIAR's, Waivers or Open Certification**
 - Airlock EVA Power Supply Assembly (PSA) 28 volt adapter. Adapter needed to use middeck battery charger as a contingency item to the Station Airlock Battery Charger Assembly. Testing not complete. Certification pending kickload test and paperwork closure ECD August 3, 2001.



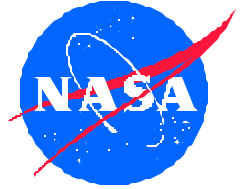
EVA Fit Checks



- **Tool to Tool Fit Check (261 total interfaces)**
 - 92 percent complete (240 of 261), consist of the following:
 - 41 Middeck fit checks – 41 completed – 100 percent
 - 70 TSA fit checks – 48 completed – 69 percent
 - 22 open fit checks in TSA (bayonet fittings) will not be performed due to accelerated turnaround of MMWS sub assemblies from previous flights
 - Risk-Low. All items are contingency equipment and have alternate method of transport to work site.
 - 0 Payload Bay fit checks – 100 percent
 - 151 MPLM fit checks – 151 completed – 100 percent
 - All incomplete fit checks have been dispositioned as acceptable through the EVA COFR Process
- **Tool-to-Interface and Interface-to-Interface Fit Checks (51 total tasks)**
 - Total of 51 fit checks, 51 complete (100 percent)

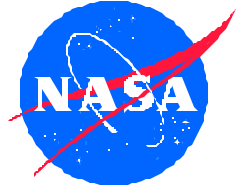


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Sharp Edge Inspections

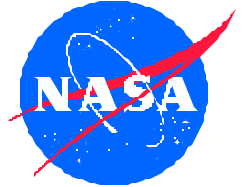
- **Sharp Edge Inspections**
 - 100 percent complete on ICC, EAS, MISSE, S0 cables, BMRRM
 - Final PLB walk down and sharp edge inspection on August 5, 2001



- **Special Topics**
 - EMU Increased Capacity Battery (ICB) Failure
 - Corrosion in Top Mounted Handrail



Increased Capacity Battery (ICB) Issue

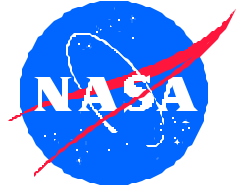


- **Background**

- During the first pre-EVA checkout on STS-104, the Increased Capacity Battery (ICB) S/N 2017 installed in EMU #3 was found to have leaked potassium hydroxide (KOH) outside the containment packaging of the battery
- The leakage deposited KOH on the Contamination Control Cartridge (CCC), the water tank structure, and other locations on the Primary Life Support Subsystem (PLSS)
- All five of the ICB's flown on 7A were formed/activated at the same time and with similar procedural deviations as S/N 2017. S/N 2017 was the only battery to be stowed and launched in an inverted position.
- After visual inspection on ISS, no electrolyte was seen on remaining ICB's. ICB S/N's 2015, 2016 and 2018 performed nominally during three EVA's on 7A
- After three EVA's, inclusive of two recharge cycles, no electrolyte was seen on ICB S/N 2015, 2016 or 2018. ICB 2015 and 2018 are stowed on ISS with a towel in a vented zip-lock bag. ICB 2017 and 2019 were intentionally returned on 7A. ICB 2016 was inadvertently returned on 7A.



Increased Capacity Battery (ICB) Issue



- **Flight STS-105 Implications**

- Two ICB's (S/N 2012 and 2014) and three Yardney batteries are slated for launch on STS-105
- These two ICB's were formed/activated at the vendor with nominal procedures
- ICB's 2012 and 2014 will be left on ISS, along with ICB's 2015 and 2018

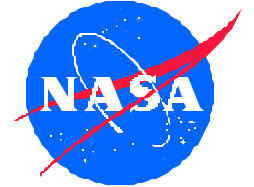
- **Root Cause**

- Final root cause determination requires return and examination of S/N 2017. Evaluation ECD is August 3, 2001.
- All possible causes have been identified and screened for on S/Ns 2012 and 2014
 - Excess electrolyte during fill/formation process
 - Failed ICB relief valve(s)
 - Cracked cell
 - Inadequate wicking orientation/configuration
- Most probable cause of these is the deviation from nominal processing procedures and incorrect wicking configuration, both exacerbated by being stowed/launched inverted.



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Increased Capacity Battery (ICB) Issue



- **Remedial Actions**

- ICB S/N's 2012 and 2014 have been successfully screened for all above causes and will not be stowed inverted
 - 7A.1 ICB's S/N 2012 and 2014 have been successfully screened for electrolyte leakage (inspection of wicking material revealed negligible KOH residue, wicking was changed out, and inverted orientation resulted in no leakage)
 - Additional layer of wicking material (allowed per B/P) was be added to ICB's S/N

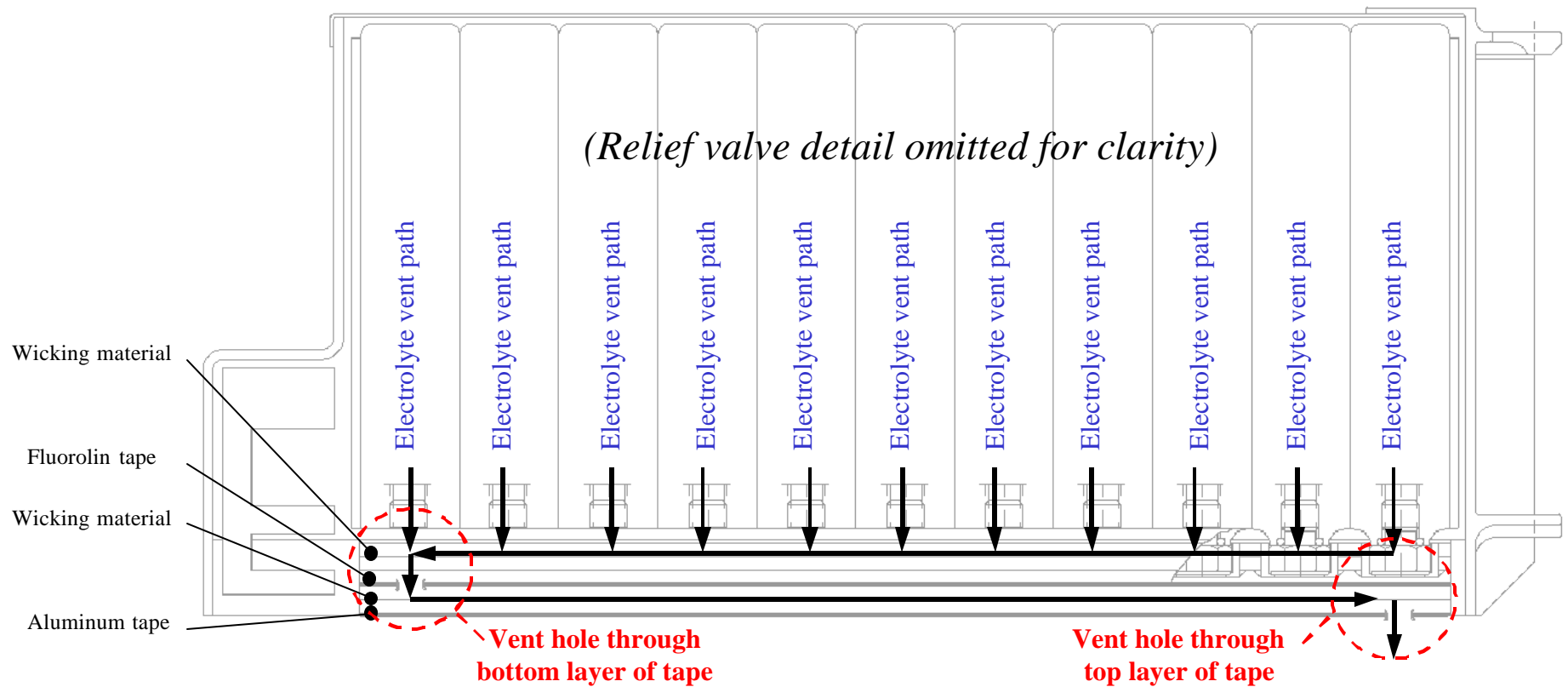
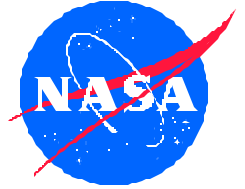
- **Status**

- ICB's are ready to support launch, use and return on STS-105/7A.1



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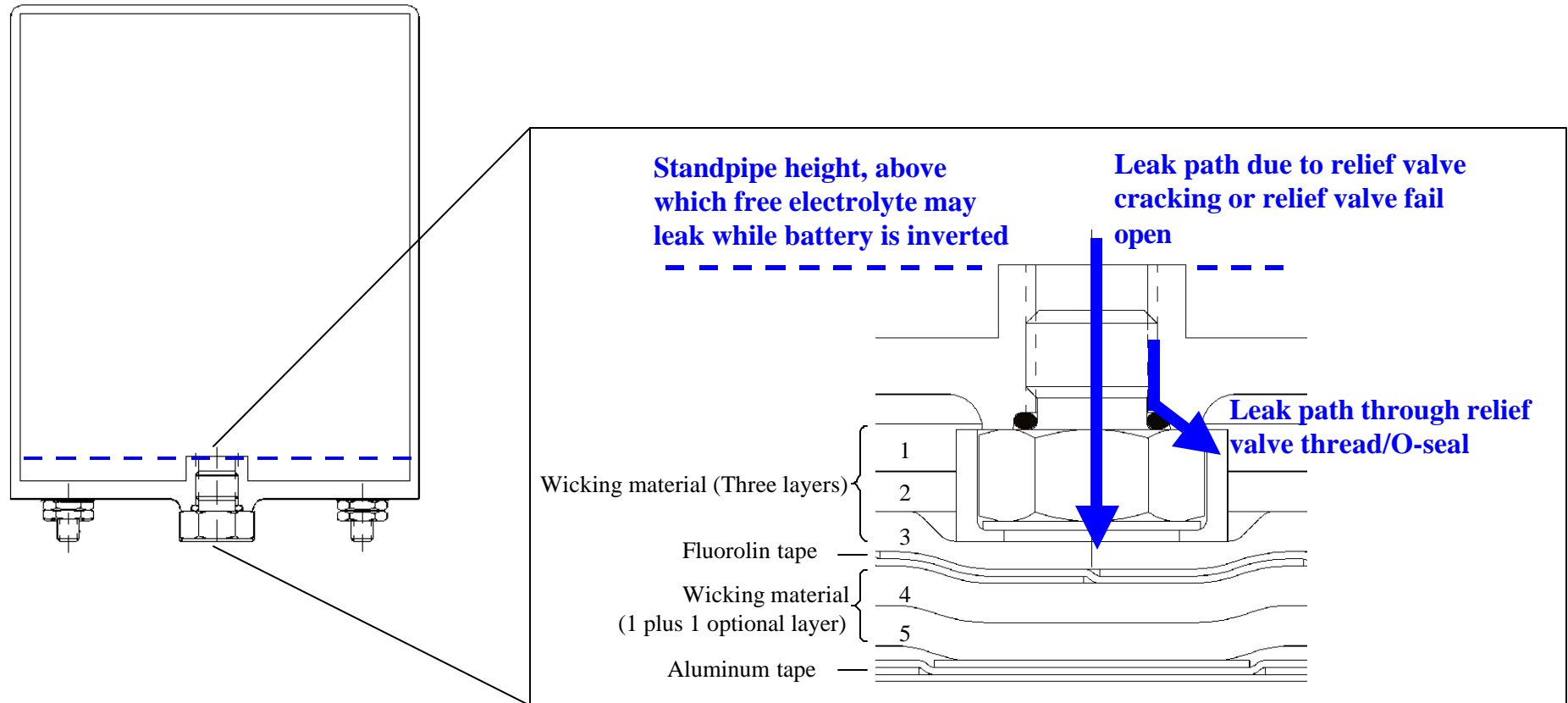
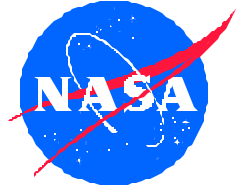
Increased Capacity Battery (ICB) Configuration





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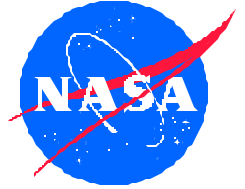
Increased Capacity Battery (ICB) Configuration





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Corrosion in Top Mounted Handrail Brackets

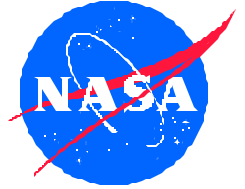


- **Background**

- Aluminum oxide was discovered within the through hole of several brackets of gold anodized top mounted handrails during a PDA.
- The stem of a bracket was cut lengthwise and the aluminum oxide was removed to reveal a severe pitting of the base material.
- From these findings the Engineering Directorate's, Structures and Mechanics Division's, Test Branch, has recommended that handrails with similar corrosion not be used since fracture analysis has yet to be completed on the corroded brackets.
- Other EVA Handrails assembled with this type of bracket are also under suspicion.
 - Custom EVA Handrails
 - Clear anodized top mounted handrails



Corrosion in Top Mounted Handrail Brackets



- **Root Cause**

- Investigations indicate that the corrosion is caused by the chemicals used during the anodizing process not being properly cleaned from the handrail bracket.

- **Interim Corrective Action**

- An Interim FIAR closure for STS-105/7A.1 has been approved since the crew will not be safety tethering to Top Mounted Handrails during scheduled EVA Tasks.
- This anomaly is not a constraint to STS-105/7A.1.

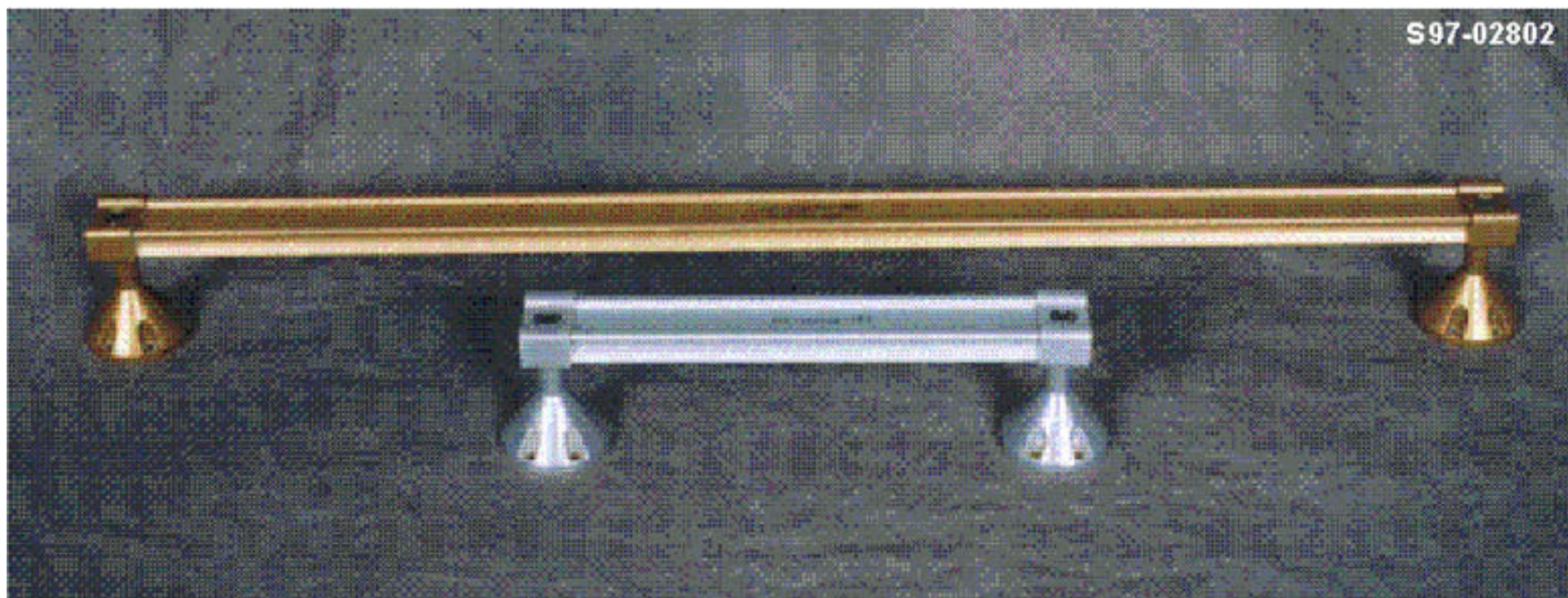
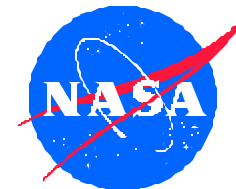
- **Forward Work**

- Determine if corrosion is only occurring within one lot of handrails brackets.
 - Initial inspection of 130 brackets representing 16 different lots supports that the discrepancy is contained within one lot.
- Determine the current locations of all the brackets from the known discrepant lot in order to replace affected handrails.
 - STS-105/7A.1 has not received brackets from know discrepant lot.
 - STS-108/UF-1 is the first flight which has received brackets from discrepant lot.
- Inspect the remaining brackets from the known discrepant lot to discover the worst corroded bracket. Potential to perform testing to determine if the handrail still meets safety tethering specifications is still under consideration.



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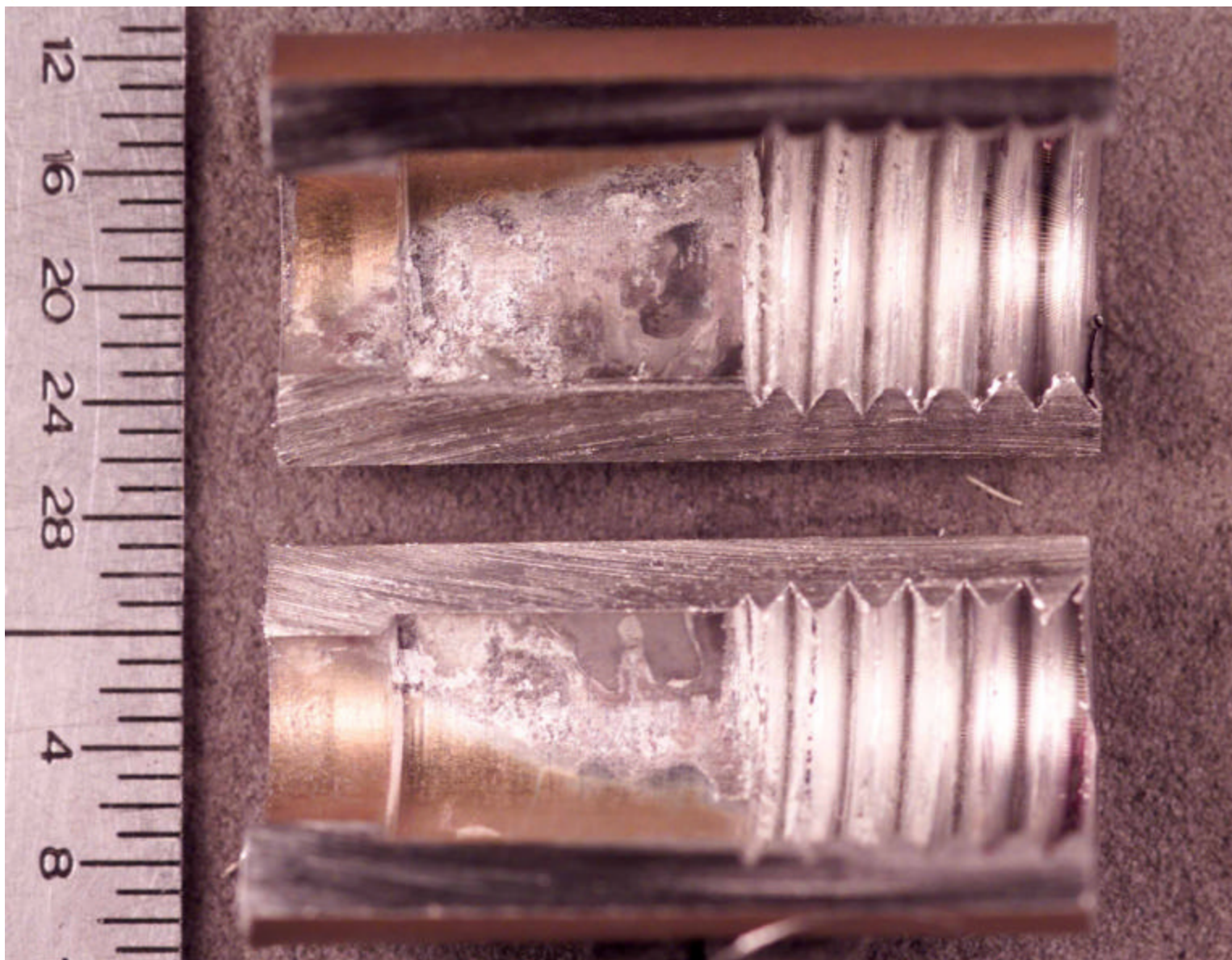
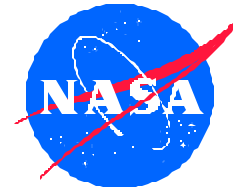
Corrosion in Top Mounted Handrail Brackets





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Corrosion in Top Mounted Handrail Brackets



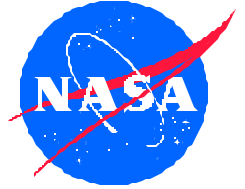
EVA-21

Maria Tullar
August 1, 2001



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STS-105/7A.1 SORR Planned Forward Work

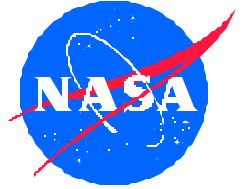


	Title	Definition	Org	Due Date	Risk
SOW	V1103	V1103	EC/USA FCE	7/31/01	Low
SOW	PLB Walkdown	Payload Bay Walkdown and Sharp Edge Inspection	VITT	8/5/01	Low



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STS-105/7A.1 FRR



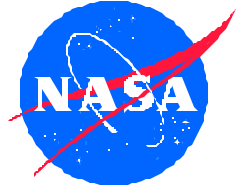
- There are no EVA exceptions for STS-105/7A.1 FRR
- The EVA Project Office is ready to proceed with 7A.1 launch and on-orbit operations pending completion of the identified work
- All open work will be closed or dispositioned by L-2

Original signed by:

G. Allen Flynt
Acting Manager, EVA Project Office



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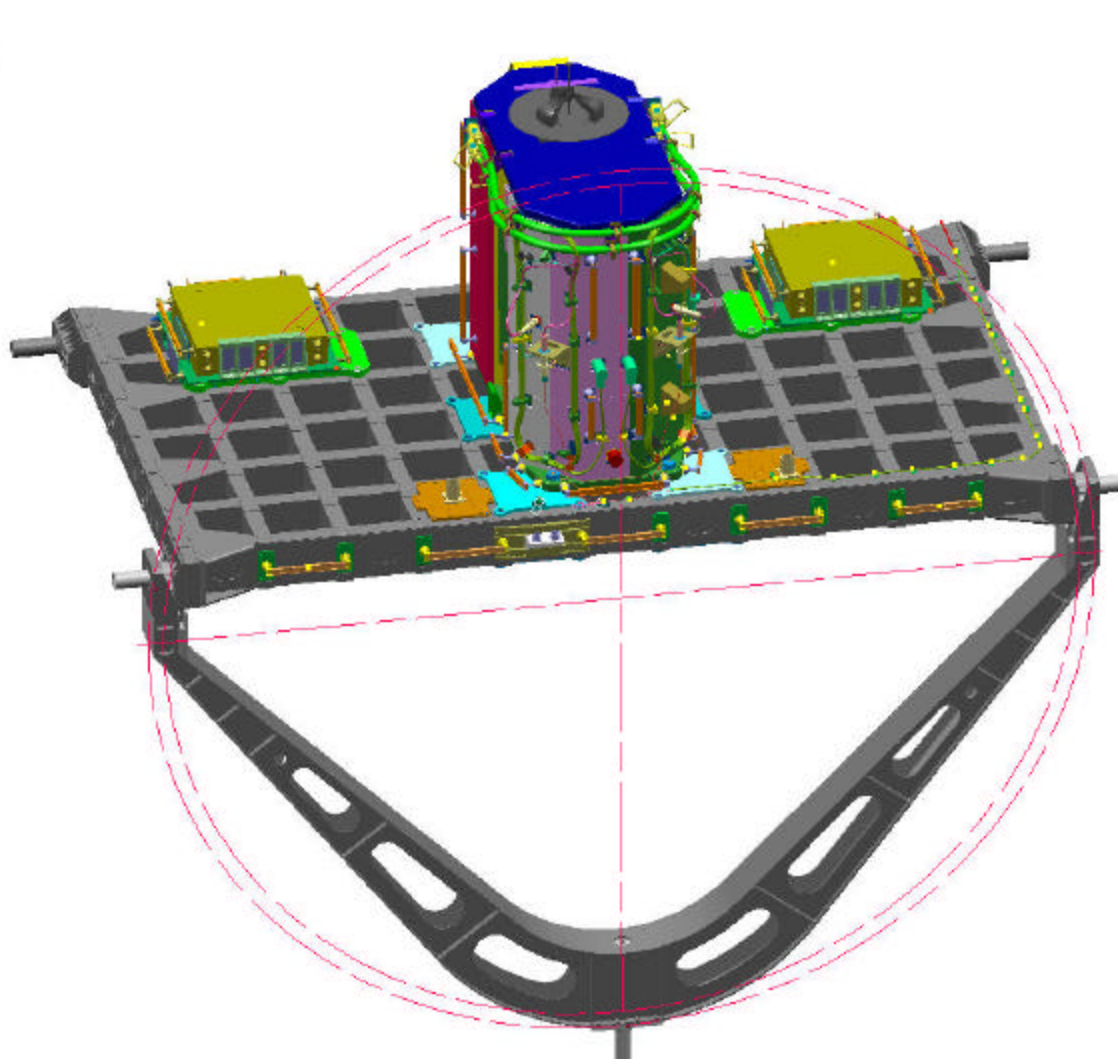
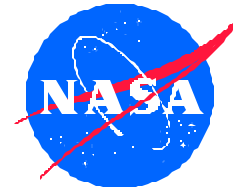


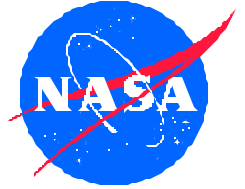
STS-105/7A.1 FRR BACKUP CHARTS



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7A.1 ICC in Launch Configuration





Previous Flight Anomalies

- **EVA Crewmember Eye Irritation**

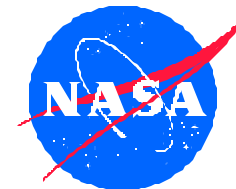
- Background

- During STS-100 a crewmember had a burning sensation in both eyes during EVA
 - Previous eye irritation scenarios had occurred during the repress phase of EVA, and were attributed to exposure of eyes to anti-fog solution (soap)

- Investigation status and rationale for flight

- Most likely cause determined to be irritant (most likely anti-fog solution) being transported into crewmembers eyes by leaking disposable in-suit drink bag (DIDB)
 - For STS-105/7A.1, DIDB is being replaced with a previous configuration in-suit drink bag (IDB) to eliminate potential leaking bite valve and thus control one known transport mechanism. IDB valve is much less susceptible to leakage
 - For ISS-3/Stage 7A.1, the risk of DIDB leakage as a transport has been accepted for any contingency EVA's which may occur during the stage.

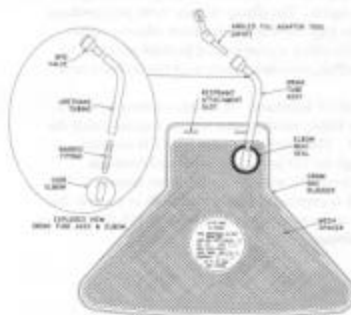
Transport Mechanism is Controlled and Crew is Properly Trained



Eye Irritant

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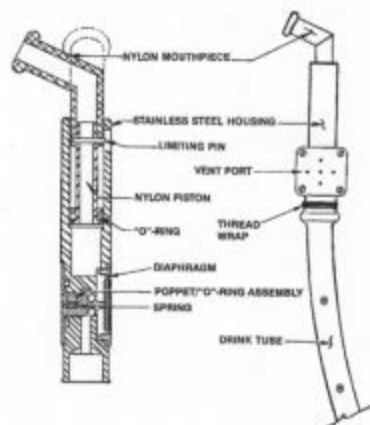
FIGURE E.1 DISPOSABLE IN-SUIT DRINK BAG (DIDB) COMPONENTS



E-4

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FIGURE 3.9.3 IDB OUTLET VALVE

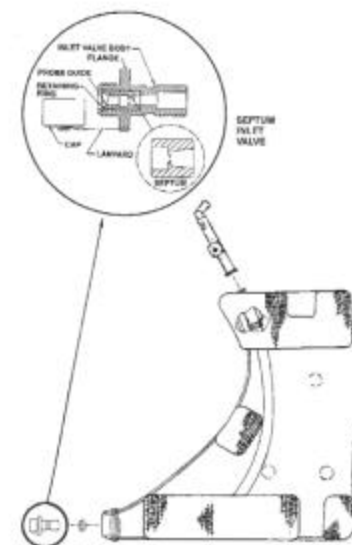


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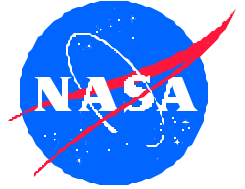
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FIGURE 3.9.2 IDB INLET VALVE



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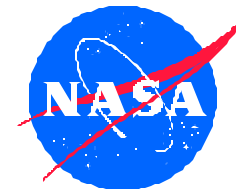
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Previous Flight Anomalies

- **EMU Boot Pressure Point**
 - Background
 - Crewmembers have experienced pressure point on feet
 - Foot discomfort has potential to be mission impact
 - Investigation Status
 - Root cause is foot contact with a pressure bladder seam on the top side of the boot
 - Depending on foot size, the boot design and foot wear (multiple sock options, boot sizing insert, thermal slippers, toe caps) selected, a stack up combination can occur to provide the potential for boot fit concerns that might not be readily screened for on the ground
 - To accommodate potential physiological changes on-orbit, options to increase foot easement have been provisioned (boot sizing inserts, thermal slippers, thinner socks, smooth bladder wrinkles, and leg length resizing)
 - Rationale for Flight
 - Modified the boot fit check process to more effectively simulate 0-g effects
 - 7A.1 crewmen have been successfully fit checked (i.e., foot easement within boot dimensions)
 - Additional crew sizing options are manifested if required for on-orbit modifications

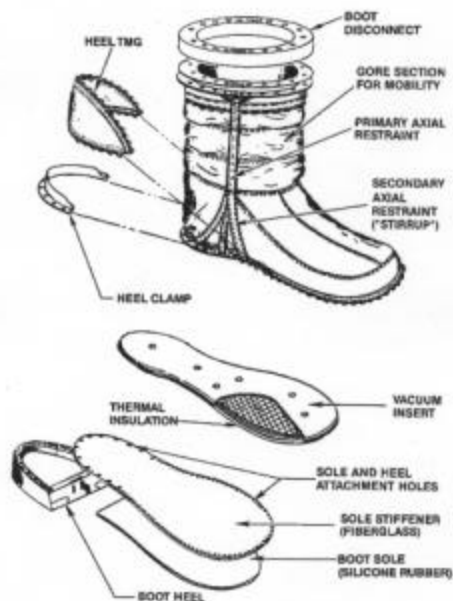
Fit Checks and On-orbit Options Ensure Proper Fit



Boot Configuration

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FIGURE 3.4.4 BOOT



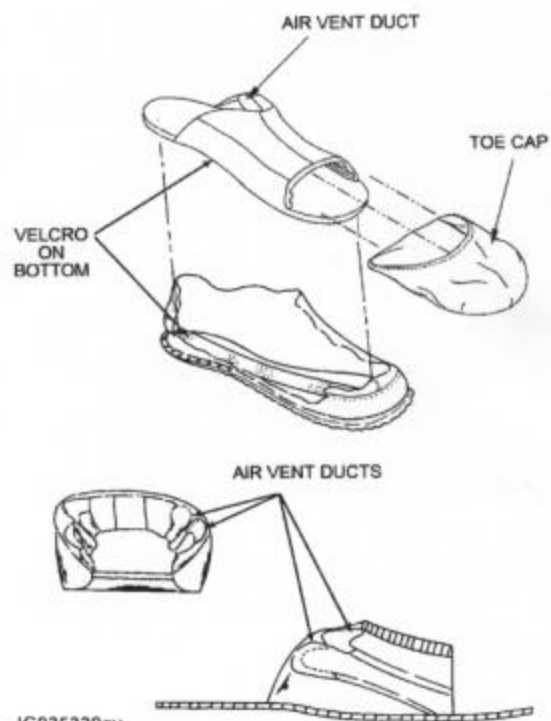
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FIGURE 3.4.5 BOOT SIZING INSERTS

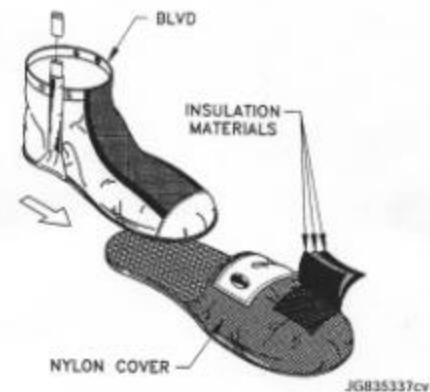


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FIGURE 3.4.6 EMU THERMAL SLIPPER (ETS) ASSEMBLY



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